



IN MEMORIAM

Remembering Alice Stewart

Few issues have perpetuated as much controversy among scientists and politicians as that of the health implications of low-level exposure to ionizing radiation. British physician and epidemiologist Alice Stewart, who died 23 June 2002 at age 95, was among the pioneers whose work helped spawn the debate nearly a half-century ago, just as nuclear weapons development was taking off. Although long regarded as a pariah by the medical/scientific establishment for her controversial views on radiation effects, Stewart became known to many as a visionary who worked indefatigably to advance the understanding of radiation health effects and cancer etiology.

During the 1950s, while working in the Department of Social Medicine at Oxford University, Stewart and her colleagues noticed a sharp rise in childhood leukemia at a time when antibiotics were contributing to a decline in childhood mortality from infections. With a modest grant of £1,000, Stewart launched the Oxford Survey of Childhood Cancers, which interviewed British women whose children had died of lymphatic leukemia and compared the medical records of those children with those of age- and sex-matched healthy children from the same regions during the period 1953–1955. Stewart first reported her findings in a 1956 paper published in *The Lancet*, showing that children who died of cancer had received prenatal X rays twice as often as healthy children, and at a mere fraction of the exposure level considered safe at the time.

Stewart's findings sparked vehement attacks not only from the medical profession—which had become enamored of X-ray technology, using it frequently—but also from the nuclear industry, which had long assured the public that low-level radiation was harmless. Critics cited studies of A-bomb survivors from Hiroshima and Nagasaki suggesting that

medical X rays were safe regardless of age at the time of exposure. The survivor data were considered at that time to be the gold standard for assessing the health effects of radiation exposure, and Stewart's findings were regarded by many as specious for about two decades. In the words of Arthur C. Upton, fellow emeritus of the Collegium Ramazzini, an international community of scholars that

the A-bomb survivor data gave a biased picture of radiation effects because they represented an atypically robust group (those who had survived the blast and subsequent devastation). Stewart also inferred that, although many of the survivors escaped cancer, many others went on to die of what was eventually identified as radiation-related immune system damage, resulting in aplastic anemia and susceptibility to infections. Stewart's reanalysis of the survivor data further implied that the radiation protection committees of the time had grossly underestimated the number of cancers caused by background radiation and other low-level radiation sources.

Stewart, a fellow of the Royal College of Physicians (the youngest woman ever elected) and cofounder of the *British Journal of Industrial Medicine*, authored more than 400 scientific papers during her prolific career. Her pioneering work in industrial epidemiology and radiation health effects was recognized when she was made a fellow of the Royal College of Medicine and Public Health in 1985. The following year, she received the Right Livelihood Award (the so-called “alternative Nobel Prize” presented by the Swedish Parliament), which credited her for “an essential contribution to making life more whole, healing our planet, and uplifting humanity.” A fellow of the Collegium Ramazzini, Stewart also received the Ramazzini Award for epidemiology in 1992. Four years later, Birmingham University made her an honorary professor.

Stewart's work contributed greatly to our understanding of the potential hazards that small doses of radioactivity could pose to human health and the quality of life. Her studies linking child cancers with fetal X rays left an indelible mark on the medical care of pregnant women, and her studies of adult cancer rates among the Hanford nuclear workers eventually led to worker compensation legislation. Says Upton, “She will long be honored and celebrated for the Oxford Survey and for the stimulus that her work has provided to the fields of radiation protection and public health.” —M. Nathaniel Mead



Alice Stewart

promotes the study of occupational and environmental health issues around the world, “To many in the nuclear power industry, the medical profession, and the radiation protection community, her views [were] too far outside the scientific mainstream to be fully credible. To others, however, Alice [was] a trusted champion of the precautionary principle.”

Then, working with Oxford statistician George Kneale in the 1970s, Stewart provided evidence suggesting that workers at the Hanford Nuclear Site in Richland, Washington, were dying of cancer induced by occupational radiation levels that were well below the exposures considered safe at that time. Stewart argued that

LEAD

Lead Challenges China's Children

A recent study in the Chinese city of Shenzhen has revealed excessive blood lead levels in two-thirds of the city's children, reflecting what many believe is a problem throughout China's industrialized cities. Researchers with the Chinese Medical Association found that 65% of the 11,348 schoolchildren they tested had concentrations above the safe limit of 10 µg/dL set by the World Health Organization, according to an article in the 19 June 2002 *Los Angeles Times* on the unpublished study.

According to Anne Platt McGinn, a senior researcher with the Worldwatch Institute who specializes in environmental health, the problem in China is especially acute in the rapidly developing urban areas. Studies support her claim. One, published in the January 2002 *China*

Medical Journal, showed that 18% of children immigrating from mainland China to Hong Kong had blood lead levels greater than 10 µg/dL. Another study, published in the 1 September 2001 issue of *Environmental Research*, found concentrations over 10 µg/dL in 27% of children aged 1–5 years in Wuxi City.

Excessive blood lead is associated with nervous system impairment, including cognitive difficulties and behavioral problems. At high enough exposures, lead can stunt children's growth and cause permanent brain damage and mental retardation. Children are more vulnerable to lead poisoning than adults because they breathe air closer to the ground, where lead concentrates. Very young children also are more likely to put lead-contaminated objects in their mouths.

Throughout most of the last half-century, environmental protection in China was overlooked as the country focused on industrialization. In the last decade, though, the consequences of uncontrolled growth have become impossible to ignore as pollution has fouled China's water and air.

McGinn and others believe that Chinese children's blood lead levels are near their peak and should soon drop as China

continues to clean up its polluted environment. "Certainly I think over time lead will decrease," says Xiaobin Wang, an associate professor of pediatrics and maternal and child health at Boston University Medical Center, and a native of China. "There is increasing public awareness to improve the environment."

One measure China is taking to protect children from lead is a phaseout of leaded gasoline. China's adoption of unleaded gas has been spotty, according to the *Times* article. "My understanding is that leaded gas is not being produced in China," says James Rochow, director of international programs for the Washington, D.C.-based Alliance to End Childhood Lead Poisoning. "But it

seems leaded gas is available, especially in the far western provinces." Government officials say the country is working to eliminate it altogether. "I think it's been phased out in many big cities," says press secretary Sun Weide of the Chinese embassy in Washington, D.C.

Removing lead from gasoline drastically reduced lead exposure in the United States. Since the 1970s, American children's blood lead levels have dropped 80%, to a geometric mean of 2.0 µg/dL.

In China, though, it might take more than a switch to unleaded. A report from the Shanghai Second Medical University published in the October 1999 issue of the *China Medical Journal* showed that the blood lead of children living in Shanghai did not drop as much as expected after the city phased out leaded gas. The authors suggest that exposure continued from industrial emissions. Another lead source cited by McGinn is computer and electronic waste imported from North America for dismantling in China [see "e-Junk Explosion," *EHP* 110:A188–A194 (2002)]. The equipment is broken down with few health or environmental protections, says McGinn.

Whatever the source, the Chinese government appears serious about reducing children's risk. Government officials, alarmed by results of the Shenzhen and other studies, plan to launch a nationwide lead survey of 8–10 million children, according to the *Times* article. "People are making great efforts to improve the environment," Wang says. "There'll be tremendous changes." —**Cynthia Washam**



Kid-friendly gas. Phasing out leaded gas is one step toward lower blood lead for Chinese children.

Longer Breastfeeding Better for Baby

Sometimes more really is better. In a presentation at the 2002 Pediatric Academic Societies annual meeting, Caroline Chantry of the University of California at Davis described an analysis of data from a national survey of 2,277 children aged 6–24 months. After looking at rates of pneumonia, wheezing, and recurrent colds and ear infections, Chantry and colleagues found that babies who were fully breastfed for six months—that is, they received formula on a less than daily basis—had a fivefold reduced risk of pneumonia during the first two years of life and a twofold reduced risk of recurring ear infections over babies who were fully breastfed for only four months. The American Academy of Pediatrics, the WHO, and the U.S. Surgeon General, among other authorities, recommend breastfeeding for at least the first six months of life.



Granting Children Better Health

To gain a better understanding of how children's health is adversely affected by exposure to environmental chemicals, the U.S. EPA awarded six research grants totaling more than \$4.5 million in May 2002. Grantees will look at the effects of fetal exposure to phthalates, nicotine, chlorpyrifos, and chemical carcinogens. Other projects will measure and model the exposure of young children to permethrin and other insecticides, and develop the study of meconium (a newborn infant's first stools) as a tool to determine fetal exposure to such environmental toxicants as heavy metals and pesticides.

Organic Labels Hit the Shelves

On 21 October 2002, new USDA national standards for organic foods take effect, standards that some industry insiders acknowledge as the most stringent in the world. The standards apply to all food and fiber products labeled as organic, including imported products, and require them to be certified by a USDA-accredited agency. Under these new standards, every phase of food production, from farm to retail shelf, is subject to inspection.

Four labeling categories have been established. Foods labeled "100% organic" or "organic" (for products with at least 95% organic content) can display the *USDA Organic* seal. Items containing at least 70% organic ingredients may display the phrase "made with organic—" for up to three ingredients. Products containing less than 70% organic ingredients can identify organic components on their ingredient list.



ALLERGIES

Global Warming Prolongs Sneezin' Season

The level of atmospheric carbon dioxide (CO₂) is predicted to increase throughout this century, largely due to the burning of coal, oil, and natural gas. In addition to contributing to global warming, higher concentrations of this greenhouse gas may also be increasing the incidence of allergies and asthma by raising pollen counts. A study published in the March 2002 issue of the *Annals of Allergy, Asthma, and Immunology* finds that plants produce more pollen when grown under high levels of CO₂, which is the main fuel for photosynthesis.

Plant pollens are ubiquitous and irritating allergens, and allergies to pollen exacerbate asthma. "Ragweed is common throughout the United States, and it is one of the most allergenic plants," says Paul Epstein, associate director of the Center for Health and the Global Environment at Harvard Medical School and a study coauthor. A rise in ragweed pollen may be an unexpected side effect of climbing CO₂ concentrations, "which is not good news for allergy sufferers," says Epstein.



Superweed. Increased atmospheric CO₂, the main fuel for photosynthesis, means more pollen, though not necessarily bigger plants.

In 1998 and 1999, Epstein and colleagues at Harvard University cultivated ragweed from seed gathered in the wild. Half the plants were grown in the then-current atmospheric CO₂ level of 350 parts per million (ppm) and half at 700 ppm CO₂, a level estimated to occur in the second half of this century. (Atmospheric CO₂ levels currently stand at about 370 ppm.) At the peak of the flowering season, pollen grains were collected

and counted. The plants grown in the higher CO₂ atmosphere produced 61% more pollen than those grown at then-current conditions. However, the ragweed plants grown in the higher CO₂ atmosphere stood only 9% taller, indicating that the plants allocated more energy to pollen production than to boosting their size.

Since the early 1900s, the incidence of allergies and asthma has steadily climbed. Experts have looked at many indoor factors, including dust mites, pets, secondhand tobacco smoke, and cockroaches, to explain the surge. Epstein suggests that additional factors are contributing: In addition to CO₂ directly fueling greater pollen production, rising concentrations of greenhouse gases cause global warming, which triggers warmer winters and earlier springs and thus longer growing seasons. In recent years, "we're seeing pollen counts of several thousands of grains per cubic meter," he says. According to the American Academy of Allergy, Asthma, and Immunology, pollen counts of just 500–1,500 grains per cubic meter signal severe alert warnings for weeds, grasses, and trees.

Because indoor allergens such as dust mites, mold, and pet dander are most commonly implicated in children's allergies, an increase in outdoor allergens "adds another dimension to discussions about the increased prevalence of allergic diseases," says Richard Weber, an allergist at the National Jewish Medical and Research Center in Denver, Colorado. Children are also more sensitive than adults to allergic triggers of asthma, such as pollen, mold, and pet allergens. So if airborne allergens from plants increase in the future, "children will probably be the main sufferers," says Weber. —Carol Potera

WASTE DISPOSAL

Mercury Misdirection

Mercury, once thought to be a benign component of items ranging from cars to thermometers, is now recognized as a potent developmental toxicant once it enters the environment. In the July 2001 issue of *Pediatrics*, the American Academy of Pediatrics (AAP) issued a policy statement about the health hazards of environmental mercury, and urged physicians and parents to stop using mercury thermometers and to dispose of them properly. However, finding out how to dispose of these thermometers locally may prove challenging, as illustrated by a survey in the May 2002 issue of the same journal.

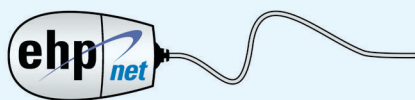
Experts at the Newark-based New Jersey Poison Information and Education System conducted a phone survey of 80 New Jersey health offices. They posed as consumers and asked how mercury thermometers should be disposed of. About half of the agencies recommended tossing them into the household trash. One-quarter said to call another agency. Only one-quarter gave the correct advice: "Put it in a protective container, and take it to a local hazardous waste center," says study coauthor Bruce Ruck.

Developing fetuses and young children are particularly sensitive to neurological damage caused by mercury. In the developing brain, mercury kills nerve cells, destroys glial cells that connect cells of the nervous

system, and interferes with the organization of brain tissue. Epidemiological studies show that pregnant women who ingest large amounts of mercury can give birth to babies with mental retardation, blindness, and seizures, even though the mothers show no symptoms of mercury poisoning. Studies have demonstrated that lower-level exposures are associated with small changes in learning and intelligence.

A typical mercury thermometer contains less than half a gram of mercury. Still, according to Lynn Goldman, a pediatrician at The Johns Hopkins University in Baltimore, Maryland, and lead author of the AAP policy statement, the goal of the AAP campaign is to educate consumers to avoid products containing mercury, using thermometers as a common example. "That silvery liquid in a thermometer is the same stuff that eventually ends up in fish and limits how much you can eat," says Goldman. "Some people never make that connection."

Besides thermometers, mercury is also found in blood pressure monitors, thermostats, dental fillings, batteries, fluorescent lightbulbs, and switches. All mercury-containing trash should be taken to a local hazardous waste facility. A few states have laws mandating that mercury switches be removed from cars before crushing them for landfill. If buried in landfills or burned in waste incinerators, mercury can make its way into the air and water. For more information about mercury, Goldman recommends visiting the U.S. Environmental Protection Agency's Mercury In The Environment website at <http://www.epa.gov/region02/health/mercury.htm>. —Carol Potera



EHP Children's Health Page

As the field of children's health has developed and grown over recent years, so has its coverage in the pages of *Environmental Health Perspectives* (EHP). Since the journal's beginnings in the early 1970s, when the idea of children's health as a discipline was yet to be conceived, EHP has published articles on child-relevant issues such as lead toxicity and arsenic-induced changes in children's hearing abilities. Today, an entire issue is devoted to the topic each year, and a new monthly children's health research section is being launched this month.

To provide a one-stop online resource for information on children's health, EHP now introduces a new webpage devoted to the



subject, located at <http://ehp.niehs.nih.gov/children/>. Continual updates and expansions are planned for the page, which went live this summer.

On the site, visitors can find a list of EHP's most current news and research articles on children's health. Also featured are links to each of the past annual issues devoted primarily to children's health topics and a link to EHP's Environews by Topic: Children's Health page, which contains the complete listing of over 100 news articles published in the journal on the subject since 1993.

The site also provides highlights of the research conducted at the 12 Centers for Children's Environmental Health and Disease Prevention Research. Initiated in 1998 by the NIEHS in conjunction with the U.S. Environmental Protection Agency and the Centers for Disease Control and Prevention, the primary goal of this centers program is to develop applied intervention and prevention methods based on basic research findings. The first eight centers established focus on the fields of growth and development and respiratory disease, while the work of the four newest is concentrated on neurodevelopment. The highlights provide brief descriptions of the centers' latest work along with links to their homepages.

A list of outside resources is available also, including a link to the recently released report by the Centers for Disease Control and Prevention, *Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention*. This report provides the first updated guidance on case management of children with elevated blood lead in over a decade. In addition, the site will soon offer a selection of upcoming conferences and seminars dealing with children's health issues.

The site also includes an overview of The Bangkok Statement and the full text of the document. The statement was drafted at the International Conference on Environmental Threats to the Health of Children, held in Bangkok, Thailand, in March 2002. Signed by educators, scientists, and policy makers from around the world, the statement is a pledge by conference participants to promote proactive strategies to protect children's health, and calls on the World Health Organization to support such efforts. —Erin E. Dooley

Noise Hurts Boys and Girls

A study of 1,400 elementary school children conducted by researchers from Cornell University and Austria's University of Innsbruck, published in the June 2002 issue of *Occupational and Environmental Medicine*, revealed that exposure at home to the everyday noise of cars, trains, and other traffic was associated with subtle declines in classroom and social behavior as well as increased distractibility, with more noise linked with greater effects. The effects were even more pronounced in children born prematurely or with low birth weight. Though the study's findings are in line with those of other recent studies, more research is needed to clarify the relationship between noise and mental health.



Smoke Chokes Learning

Exposure to even extremely small amounts of environmental tobacco smoke (ETS) can impair the learning ability of children and adolescents, according to a study by Cincinnati Children's Hospital Medical Center researchers, presented at the 2002 Pediatric Academic Societies annual meeting. Using 1988–1994 data on levels of the nicotine metabolite cotinine from the National Center for Health Statistics as an indicator of children's exposure to ETS, the researchers found a significant correlation between declines in reading, math, and reasoning scores on intelligence and achievement tests and levels of cotinine at or below 15 ng/ml. Study spokeswoman Kimberly Yolton said that more than 13 million U.S. children are exposed to ETS levels consistent with the adverse effects noted by the study.

WHO Targets Asian Tobacco Ads

On 28 May 2002, WHO Western Pacific regional director Shigeru Omi called on Asian governments to ban tobacco advertising and sponsorships, while announcing that his office has launched a campaign against tobacco marketing and sales in connection with sports. Advertising for tobacco products in Asian countries such as Cambodia and Malaysia has grown markedly in the past decade, and the number of child and teenage smokers has grown at an equally rapid rate.

Currently, up to 50,000 Asian teenagers start smoking each day. With only Singapore, Hong Kong, and Thailand the exceptions, WHO officials attribute this trend to Asia's weak laws regulating tobacco sales and marketing. Said Omi, "[Tobacco ads are] seeking a new generation of young smokers to 'replace' the millions who die from tobacco." In 2001, South Africa enacted similar measures.

